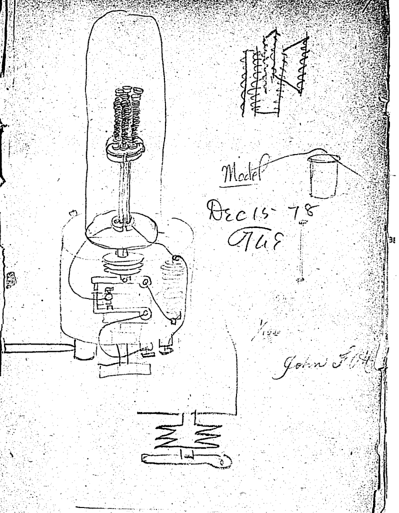
Menlo Park Notebook #9 [N-78-12-15.1]

This notebook covers the period December 1878-March 1879. All of the entries are by Edison, Charles Batchelor, and Francis Upton, with the exception of a few drawings by John Kruesi. The name of John Ott occasionally appears as a witness. Most of the material relates to experiments on electric lighting. There are drawings of lamps, including vacuum experiments; drawings of devices for making and testing wire spiral filaments; notes on platinum and platinum-iridium wire; notes and drawings of generators; calculations of system costs, including comparisons to gas lighting costs; and drawings and calculations about meters, including some labeled "Sprague's Exhibit Edison's Early Sketch No. [2-4] Jan. 12th 1886." There are also drawings of the electric pen and the phonograph. The book contains 241 numbered pages followed by 30 unnumbered pages.

No 9

May 1, 1896



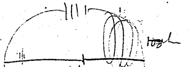
Model

Dec 15 78

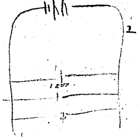
TAE

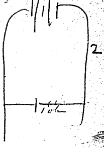
John F Ott

Dynamo mac Dec 15/78
TAE



100: of 1 ohm Each. 100 ohm





Dynamo Mac Dec 15 78
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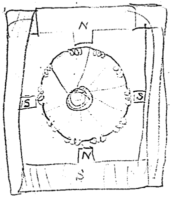

Dynamo Mach Dec 15/78
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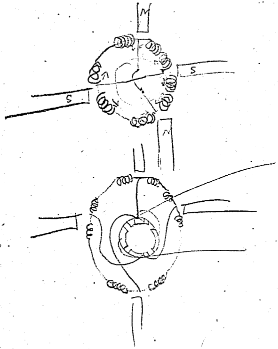

Dynamo Mach Dec 15/78
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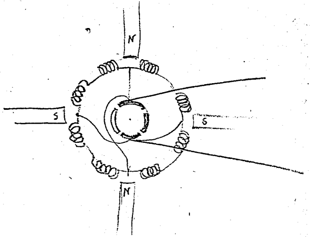

Dynamo Mac

Dec 15/78

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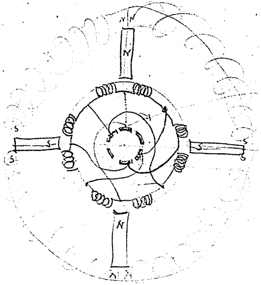
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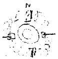
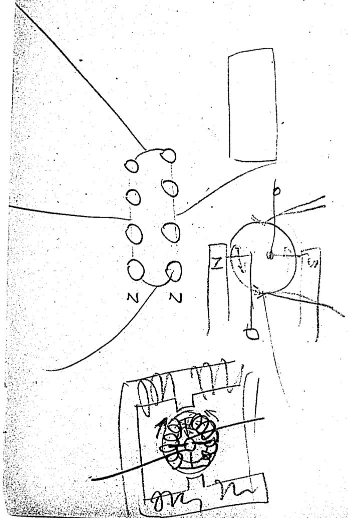
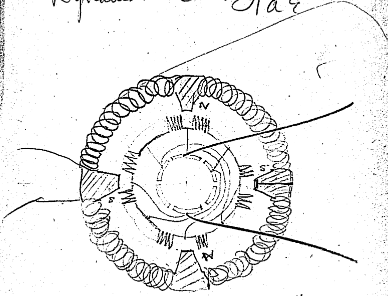




Dynamo Mac

Dec 15 1878

TAE



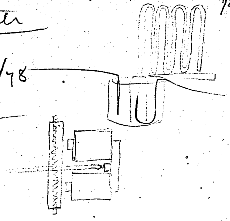
"Sprague's Exhibit Edison's early sketch, No 2."

Jan. 12th 1886

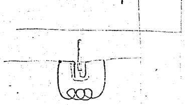
Meter

Dec 15/78

TAE



I propose to shunt a small quantity of the Current through a decomposing cell of Hg or Cu & weight the deposit every month to determine



the Current consumed - I could use the gas evolved by electrolysis but deposit is better as there is no polarization

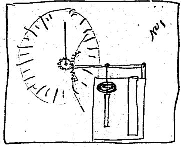
TAE

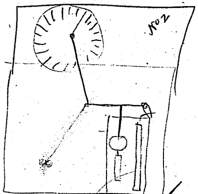
Sprague's Exhibit Edison's early sketch No. 3" Jan 12, 1886.

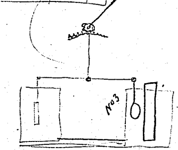
Dec 15 /78

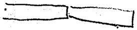
TAE

Meter.



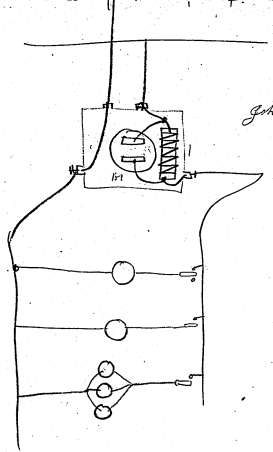




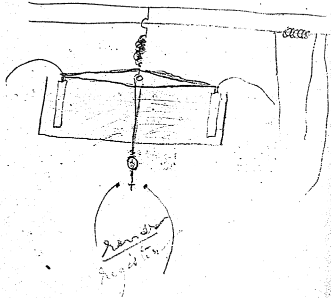


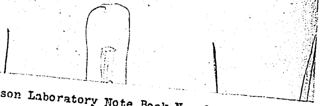
Sprague's Exhibit Edison.

early sketch No 4.



John F. Ott





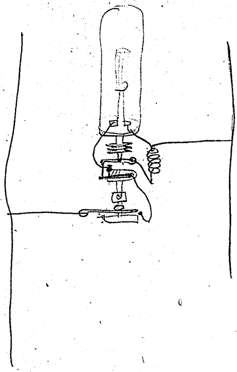
Edison Laboratory Note Book No. 9

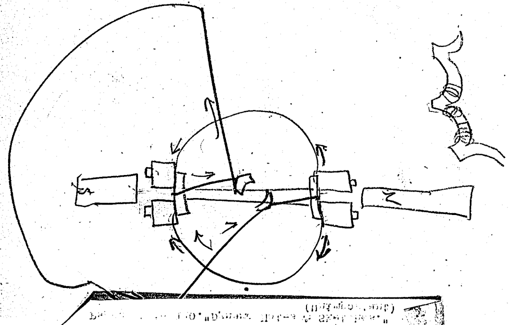
Page 21

Notes on Platinum & other metals & Metallic Oxides

See Edison Patents:

214,636	224,329
227,228	218,866
227,227	227,229

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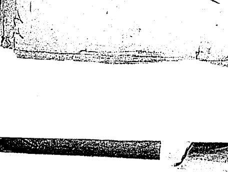
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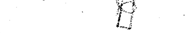
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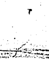

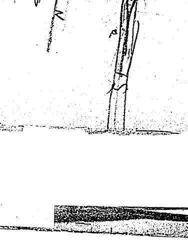
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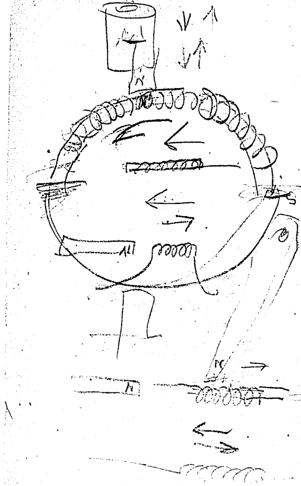
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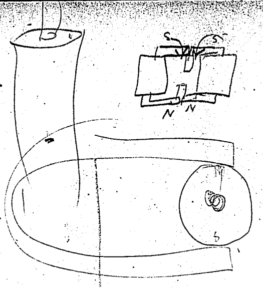
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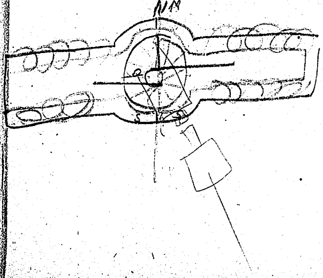
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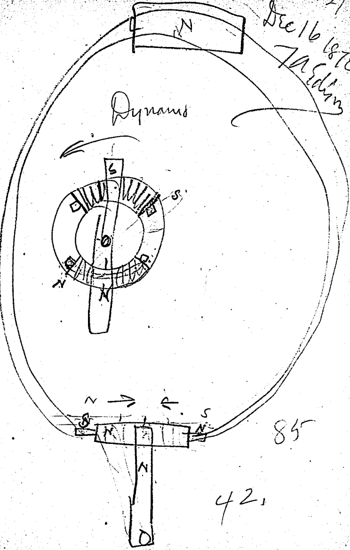
Dec 16 1878
TA Edison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Dynamo
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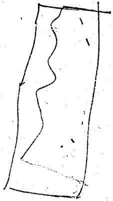
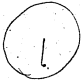
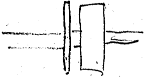
85

42,







6) 320

64
5
320

inch

64, 80, 960 —
480
320

2

100,

200.

---

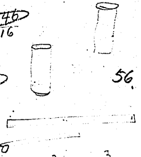
2 hp —

Cop rod $\frac{1}{4}$ inch dia 30 inch length
Res $\frac{1}{2500}$ of an ohm, temp 1000

4

~~$\frac{1}{6046}$ 3023~~ ~~$2\frac{1}{2}\overline{)6046}$ 1416~~

~~$\frac{1}{2500}$~~ ~~1416 2 2832~~



4 5
8 10
16 20
32 40
64 — 80 2, 8

12
80
960,

3/4, 3
3/8

1/2, 4
1 8
1/2

1/2. 4/4
1

7/8, 3/4.

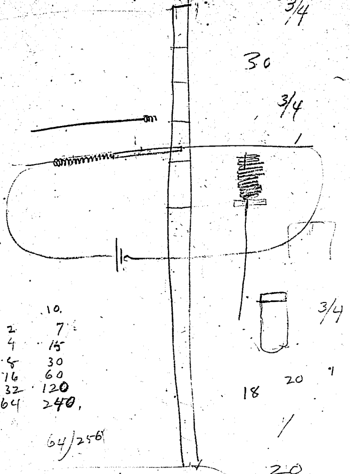
1

2

4 200 27

23
2 11 ½

5.4
1.0 27



3/4

30

3/4

1

3/4

18 20 1

1

20

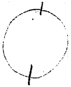
.10.

2	7
4	15
8	30
16	60
32	120
64	240

64)256

$$\begin{array}{r} 64 \\ 4 \\ \hline 256 \end{array} \qquad \begin{array}{r} 64 \\ 3 \\ \hline 192 \end{array}$$

3 2
2 2 2



$\frac{1}{2000}$ $\frac{1}{10,000}$

$\frac{1}{4}$ inch 2 miles

1/2

1

2

4

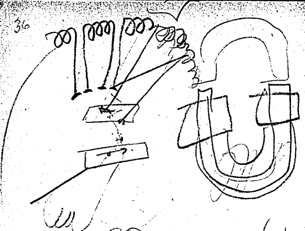
8

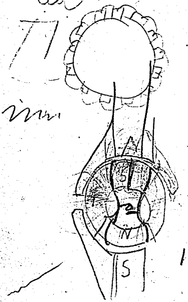
.50
0250
0062
00~~8~~7
1 3/4

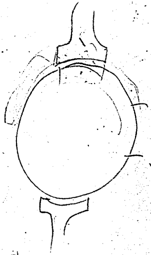
62 1/2
4
248

1. 500 50
2.

Railway







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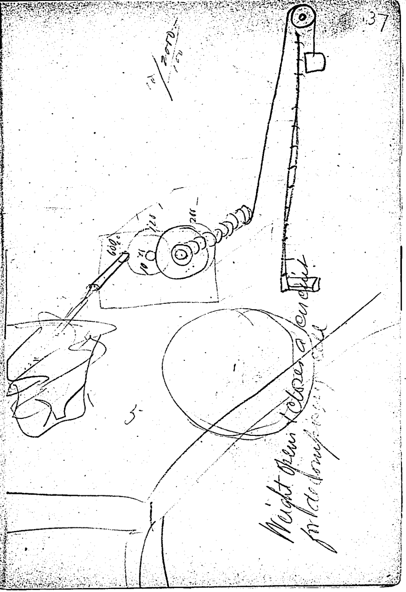
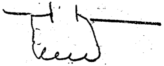
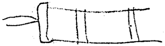
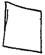
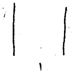


Weight opens & closes a circuit
for tele[illegible]









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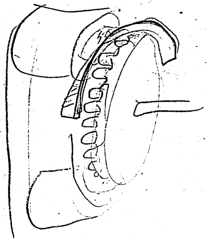
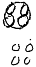
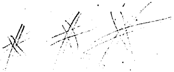
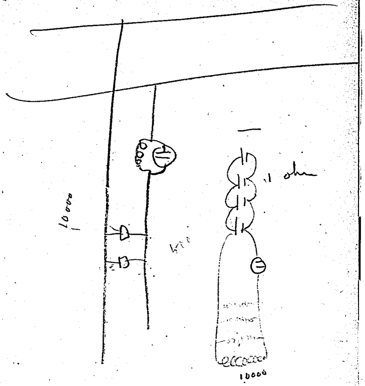







10000
.1 ohm
10000

$$C = \frac{E}{R+r}$$

$$C = \frac{E}{5000+1}$$

$$C = \frac{E}{2500+1}$$

42

4096)1352000(330
12288
12320
12288
320

$C = \frac{4}{10000 + 4}$

$C = \frac{1}{2501}$

54
7
378

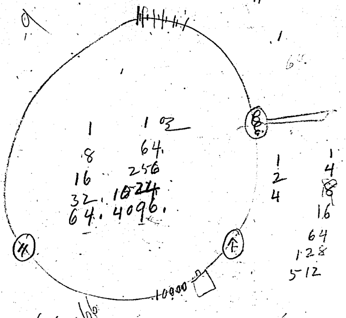
65
65
325
390
4225
4096
129

40 96 : 4225 :: 320 !
320
84500
12675
1352000

43

1 4096.

1 2 1, 64.


B
A
H
10000
1 1 02
8 64.
16 256
32. 1024
64. 4096.

1
2
4

1
4
8
16
64
128
512

64
5
320,

$C = \frac{E}{R + r} = \frac{1}{10000 + 1}$

$C = \frac{2}{1000 + 2}$

64)320

65)330.5

$$\begin{array}{r} 66 \\ 66 \\ \hline 396 \\ 396 \\ \hline 4356 \end{array}$$

4225 : 4356 :: 330 :

$$\begin{array}{r} 330 \\ \hline 130680 \\ 130680 \\ \hline 4225)\,9374880\,(340 \\ 12675 \\ \hline 16998 \\ 0 \end{array}$$

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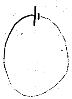
1 ohm 1.03'

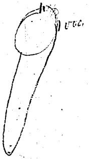


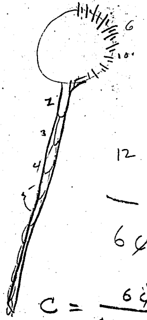
$C = \frac{E}{R + r}$

1 ohm 1 03

10,

40.





1 emf

12 12 cells.

64

$C = \frac{64}{\text{[illegible]} + 64}$

$C = \frac{64}{\text{[illegible]} + 64}$

$$\frac{80}{100000 + 80}$$

$$\frac{80}{10080}$$ –

$\frac{2}{252}$ $\frac{1}{126}$

$\frac{1}{126}$

80
80

4356 : 6400 :: 340 :
340
256
192

4356) 2176 (500
~~174224~~
80
21786
974

160

$\frac{64}{6400}$ 6.2

6

$\frac{12}{1000}$ $\frac{3}{250}$

16

$\frac{2}{125}$ $\frac{1}{81}$

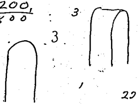
$\frac{1}{62}$

14
200,
2.800

16,
3

500,

3



72

22

66
15
330
66
1090

14
20
280.

1

1.4
80
1120

200,

14
70

14
70
980

36,

6

18
6
108

3

72.

36,

40
6
240.

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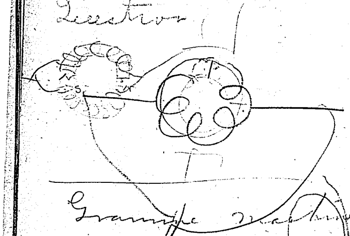
If a battery works against a Gramme

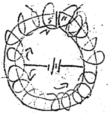
Question

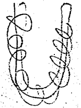


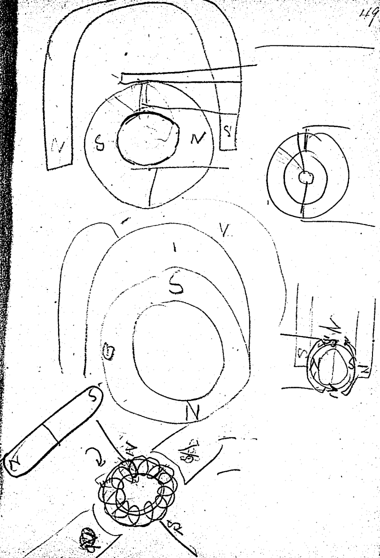
Gramme machine moves about the same

How much power

Hand break



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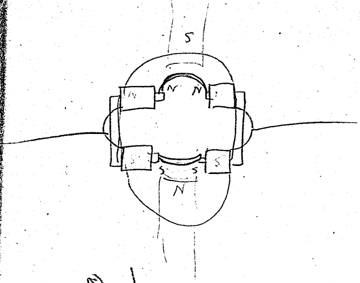
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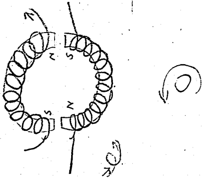
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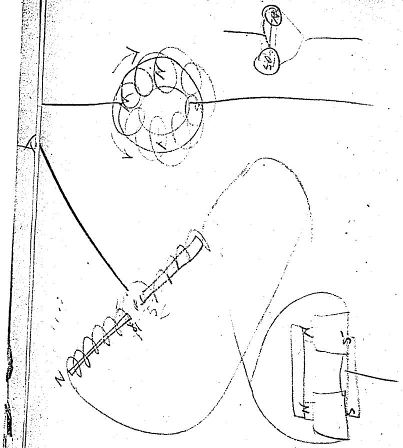
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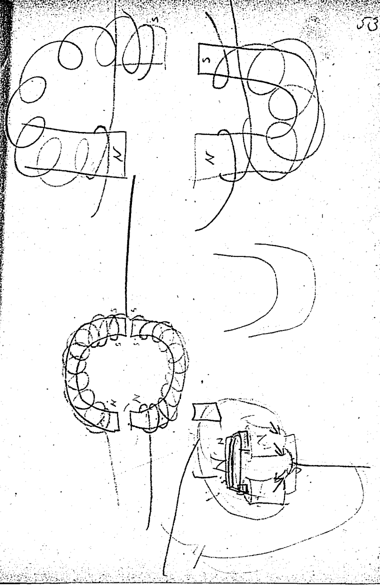
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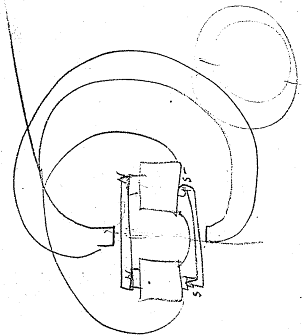
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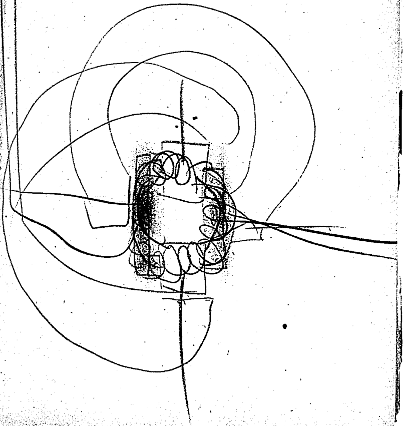

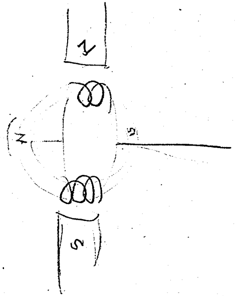
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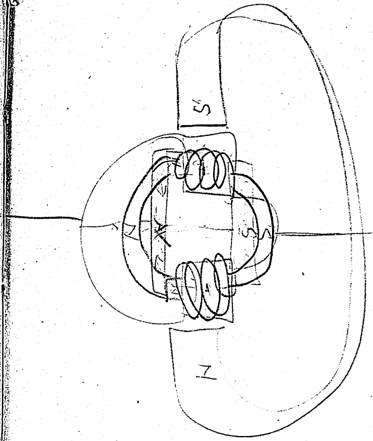
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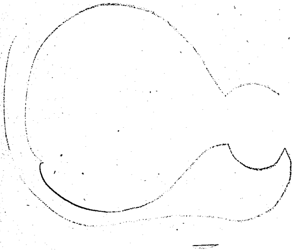

3.

No: 36 Wire

00.4

3 ft long

.00d

3.14
.004

3.14
.004

3.14
.004

0.01256

r² 3

.01256
36.

7536
3768

45216

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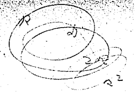


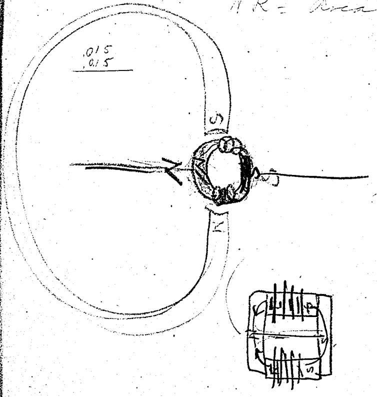
R

π r

π D = cir

π R² = Area

.015
.015



$\frac{1}{10}$

$\frac{3}{10}$ 3000°

$1\frac{1}{2}$ 4'

$\frac{3}{2} \times \frac{10}{3} = 5$ Lamps

10 Lamps

Tried magnet

tried commutator

Six lamps all red heat
from the 3 —

Six lamps $\frac{1}{4}$ in

$\frac{1}{2}$ HP 3000° 7

$1\frac{1}{2}$ inches $1\frac{1}{2}$

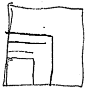
$\frac{1}{2}$ 3 Flames

$4\frac{1}{2}$ to 5 Burners to HP.

$\frac{3}{8} \cdot \frac{3}{32} = \frac{9}{256}$

8.

8 inches



.015
8
.120
.3 4
.36
9
.27

$\frac{3}{4}$ $\frac{3}{16}$
9

64) 9.0 (14
64
260
256
4

256.) 9.00 (35
768
1320

~~.035~~
27

.105
.27
.375
.27
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$\frac{7}{10}$ inch

.14
6
.84

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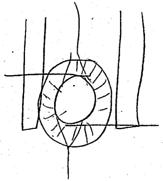

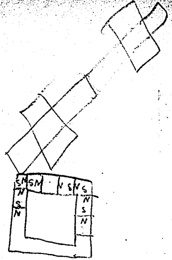
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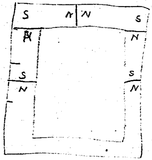
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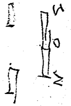
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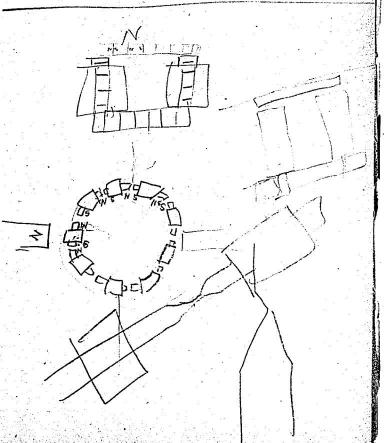
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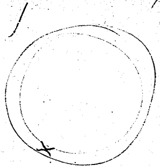

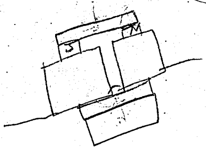
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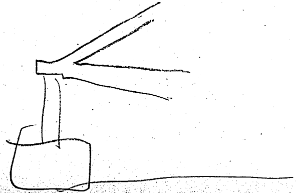

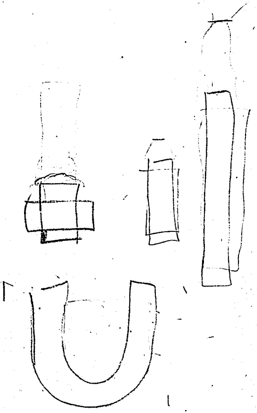

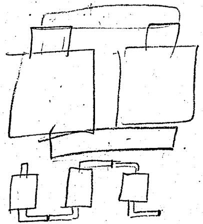

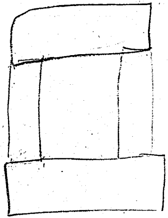

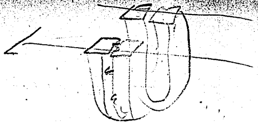

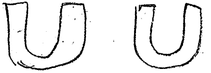

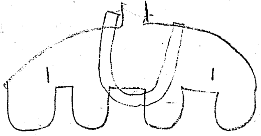

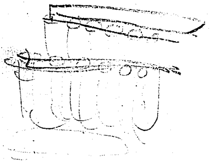

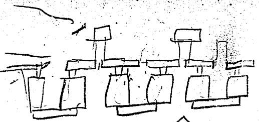

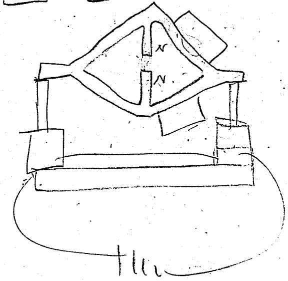
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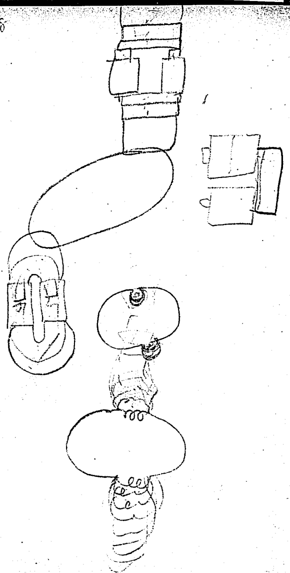

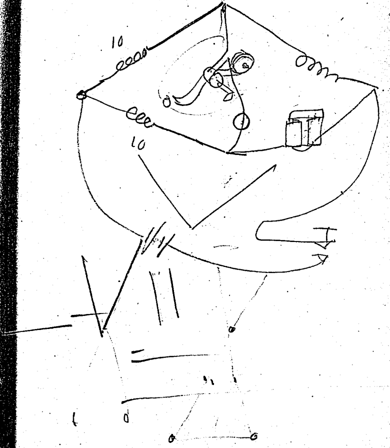
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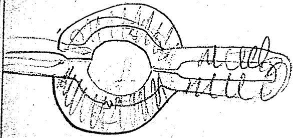

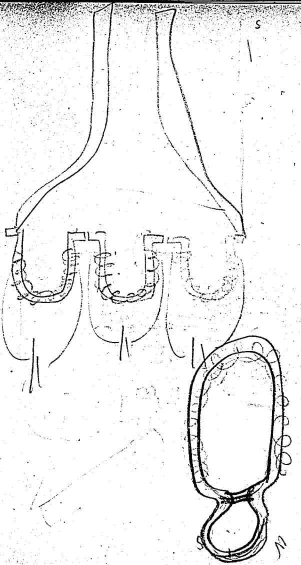
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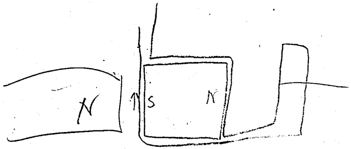
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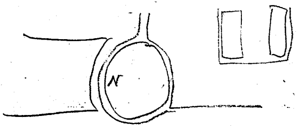
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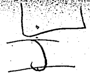

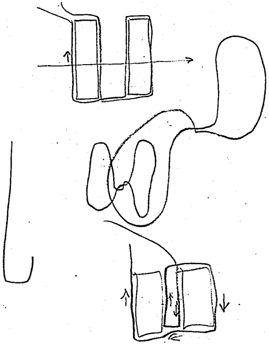

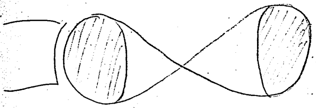

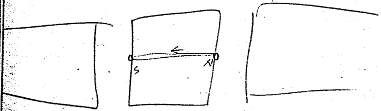
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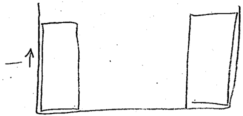

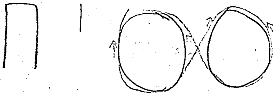

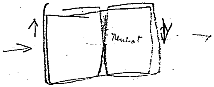
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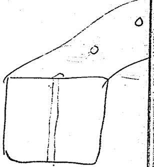

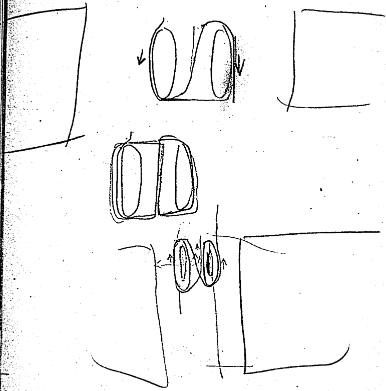

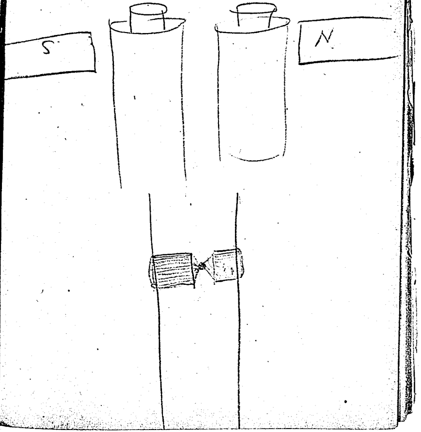
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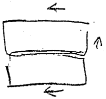

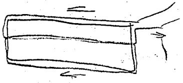

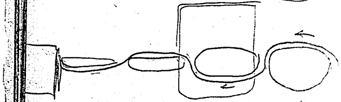

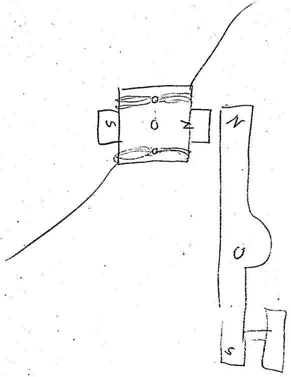
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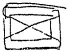

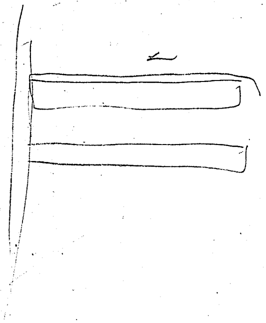

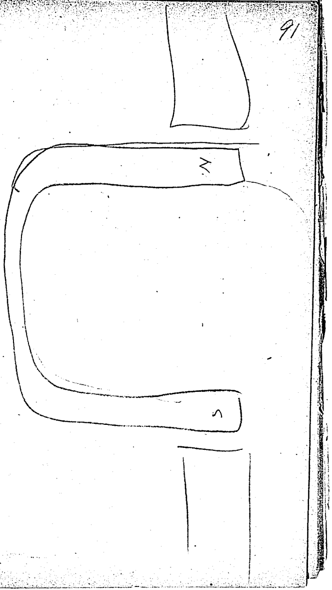

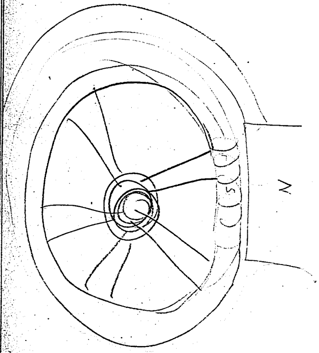
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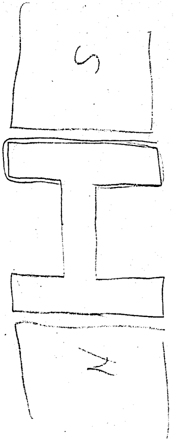
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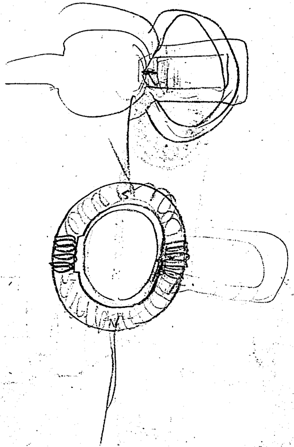
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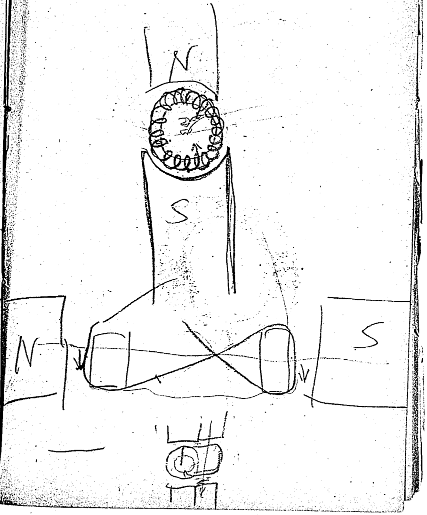
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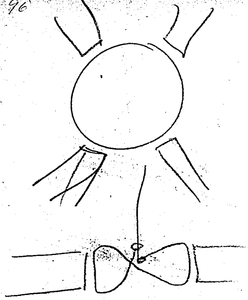

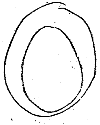

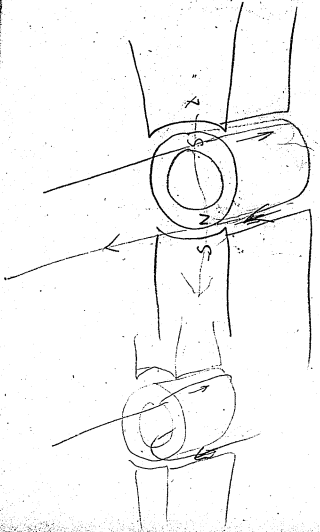

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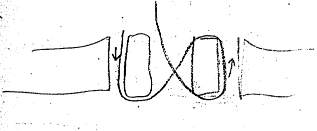

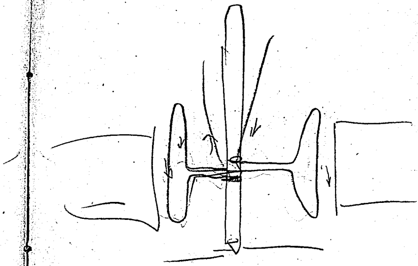

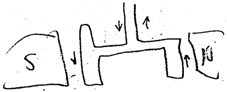
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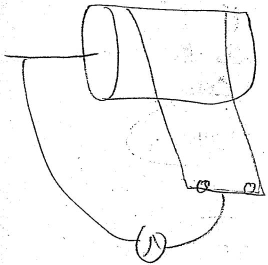

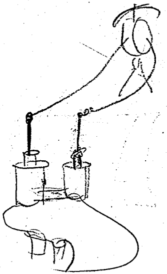

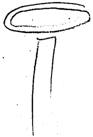

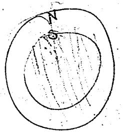

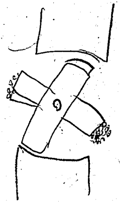

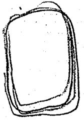

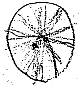

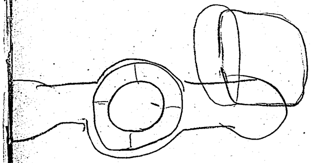

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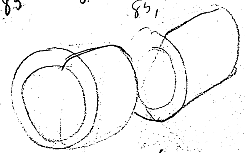
15 1100, 100.
15 45

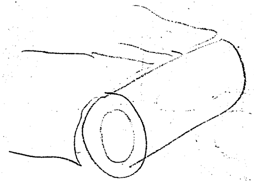
3 85 5.5 5.05,
85,

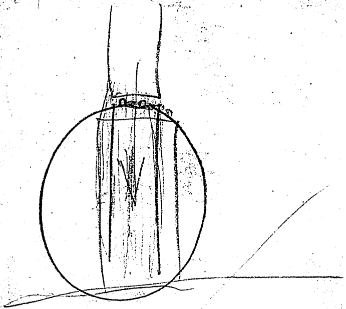
15,
45

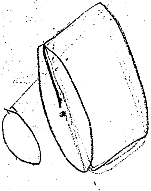
6

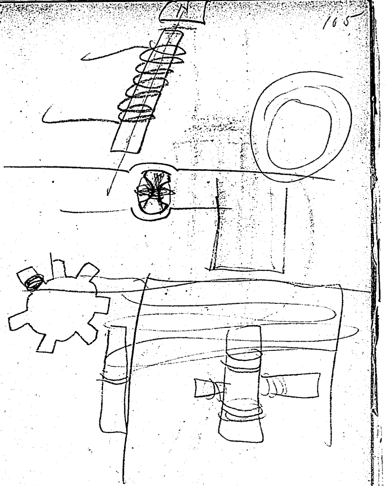
6





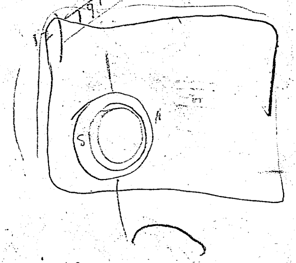


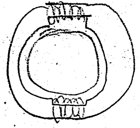


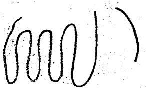


19^{0}_{10}

79^{1}_{0}

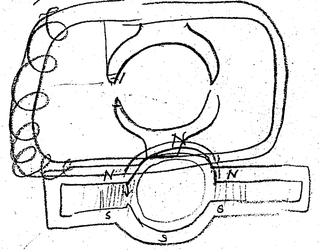


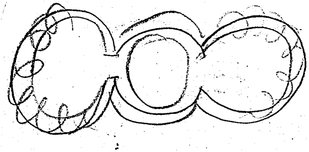


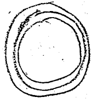


3^{2}_{6} 19^{2}

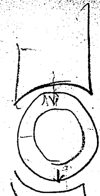
3/2



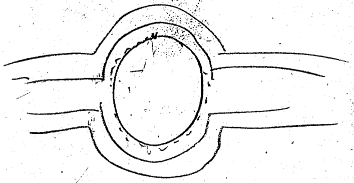




55
85
275
440
5



Demmin Stettin
55, 85

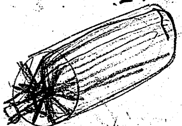


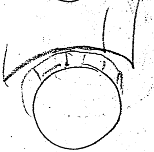
76

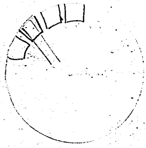
85

100. 100.

100. 600.







John Ott

Blackwalnut or better cherry —

No 1

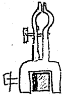
Edison Laboratory Note Book No. 9

Pages 111 to 126.

Incandescent Electric Light.

See Edison Patents:

214,636	214,637
218,866	227,227
227,228	227,229



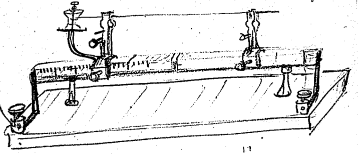
Smaller one. 2 feet long —

John F Ott

Blackwalnut or better cherry –

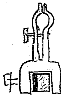
No 1

OK



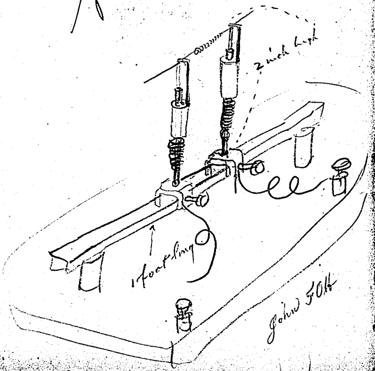
10 feet long.

divided whole length into 1/16. 1/4 1/2 & 1 inch marks.



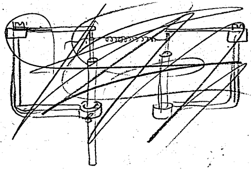
Smaller one. 2 feet long –

No 2


2 inch high
1 foot long

John F Ott

960
772
1920



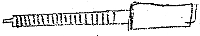
772
1000
772000

960
772
1920
20

23.

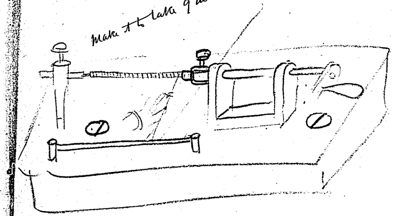
No 3

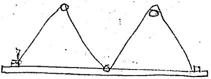
Mandrels with threads cut in
to keep wire apart,

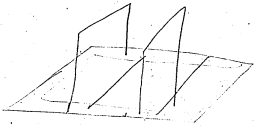


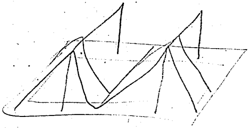
Jan 14 1879
Chas Batchelor

Make it to take 9 inches

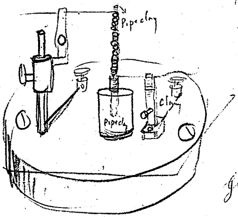






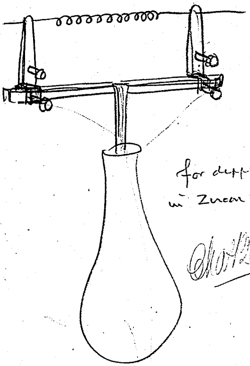


No 4


Pipeclay
Pipeclay
Clay

John F Ott

No 5 Jan 13th 1879



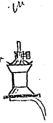
for dipping
in Zircon Solution,

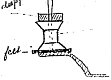
Chas Batchelor

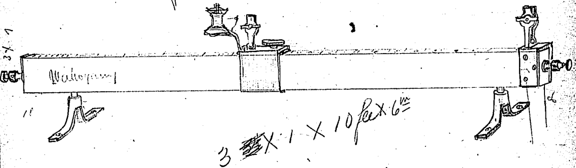
$1\frac{1}{2} \times \frac{5}{8} \times 2^{ft}\,4^{in}$

Jan 9 1899
Chas Batchelor
John F Ott

Experimental Inst for testing effects in wire


Spring on top


Weight dropped on
felt

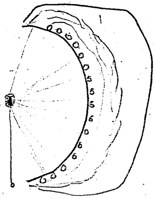

3 x 1
Mahogany
11
8

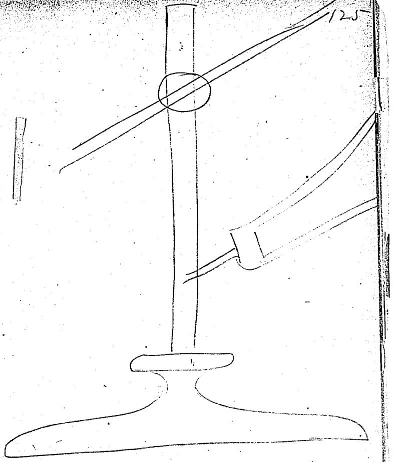
3 [illegible] X 1 X 10 feet X 6 in

Concentration of heat

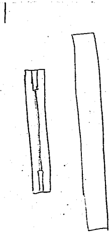
Jan 9 1879

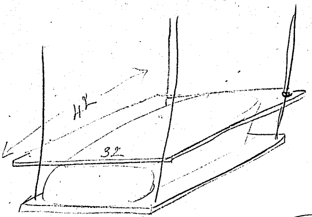
Chas Batchelor

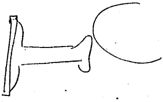


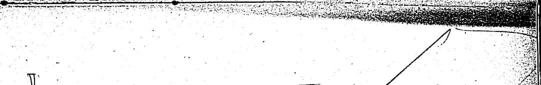


Pages 127 to 162."Dynamo Sketches, &C."
(Unimportant)

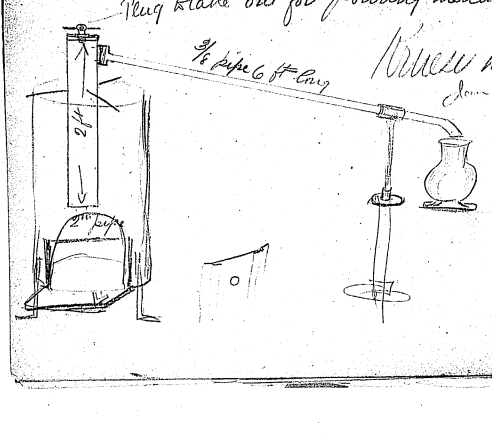



11½
32

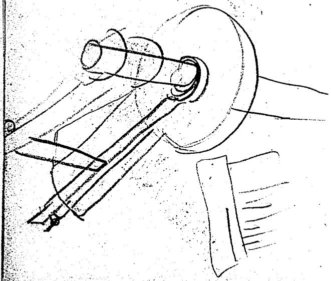


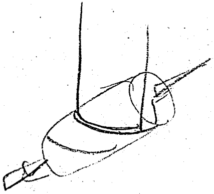


Plug to take out for pouring mercury in


3/8 pipe 6 ft long
2 ft
2nd pipe

Kruesi Make
Jan 23d 1879





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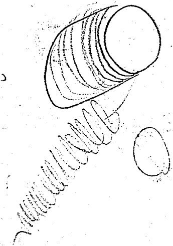
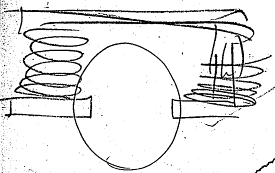
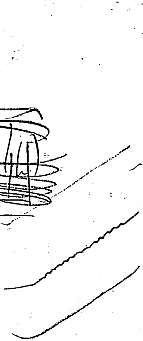
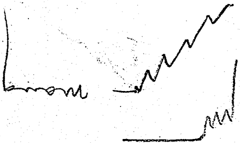
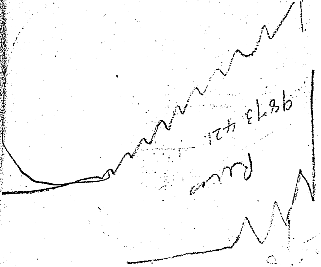
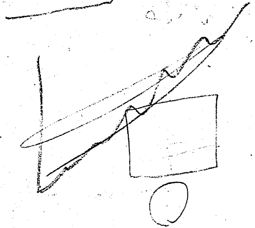






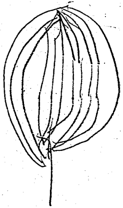


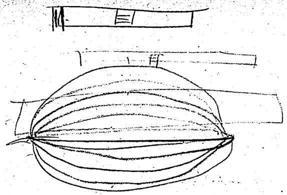

9873 421
Rivas



Wire 1 Ohm

Throw one unit of energy





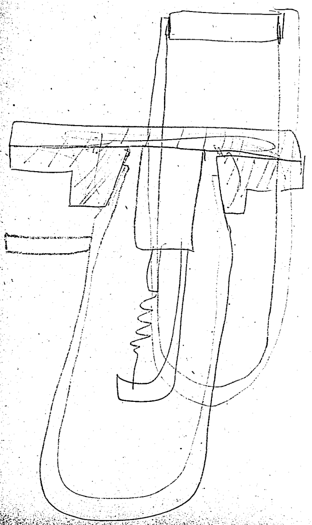
$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$

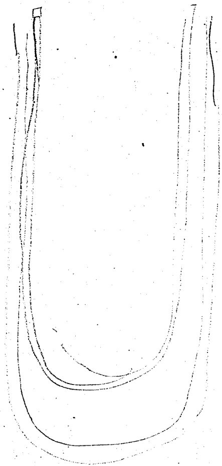
1 unit of Energy

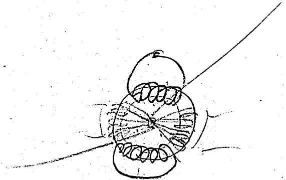
1 Unit of Energy

in 1 Ohm

10 Ohms twisted $\frac{1}{10}$







New 10.2 mg 100 mms

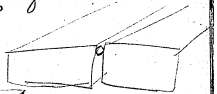
10.2
$\frac{1}{31.103}$ oz

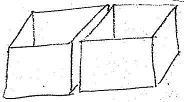
1.0086
4.5072
.4841

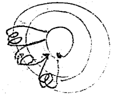
$\frac{10.2}{31.003}$ $\frac{1}{3000}$

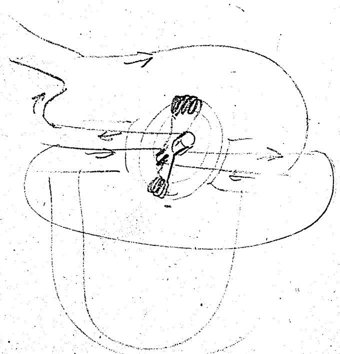
$\frac{2235}{1000}$ oz = .02 cts per foot

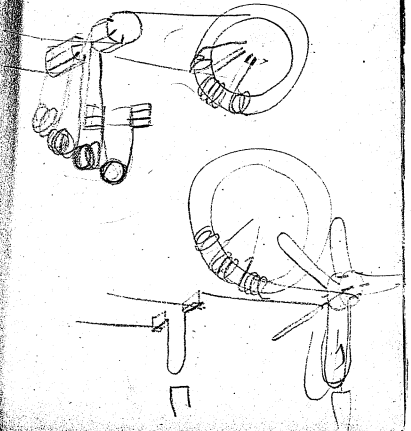
10.2

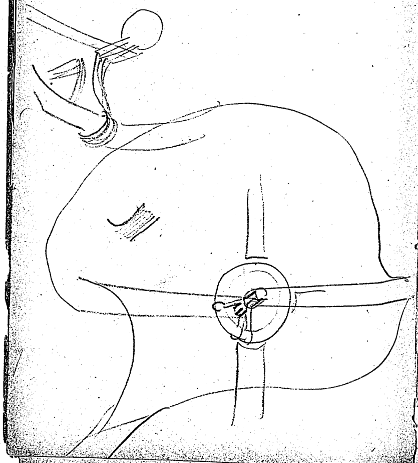


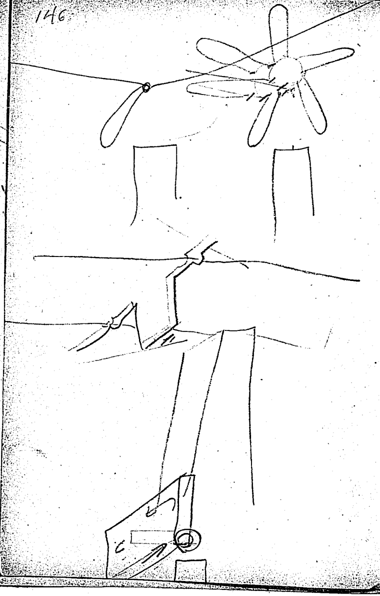








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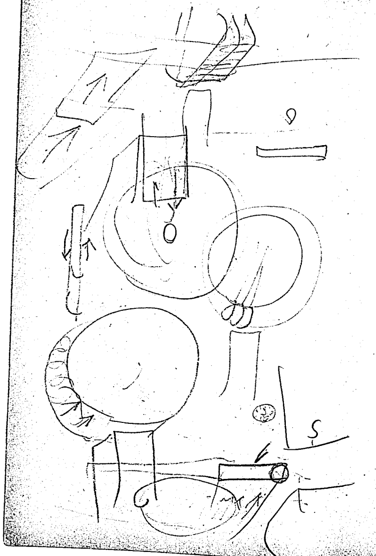
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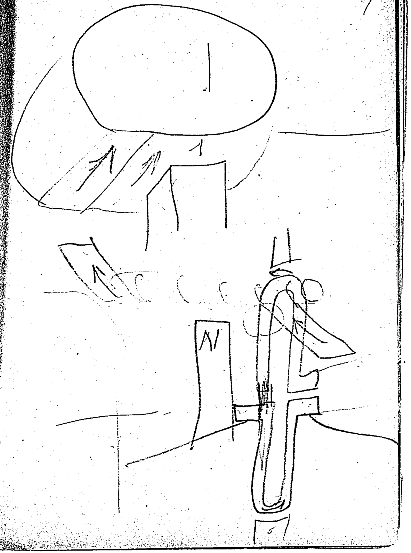
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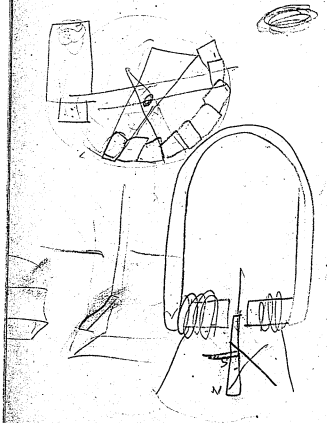
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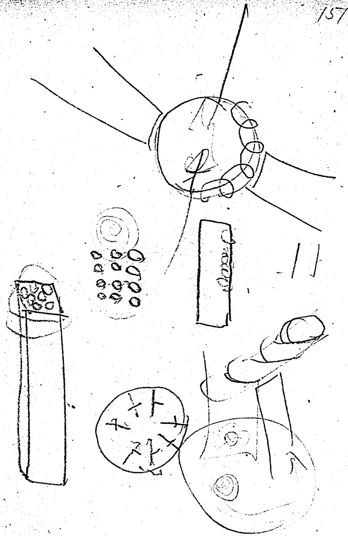

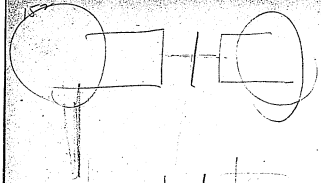

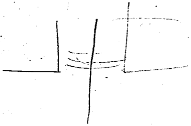

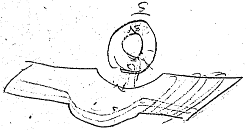
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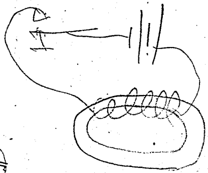

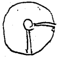

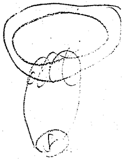

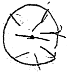

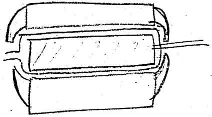

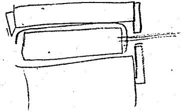

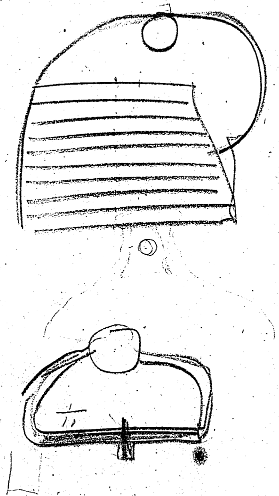
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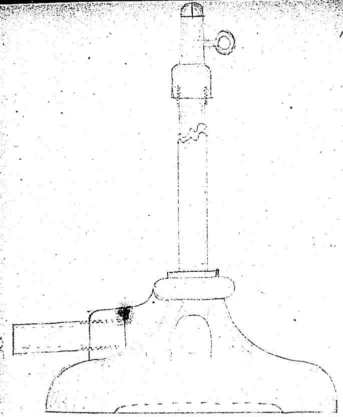
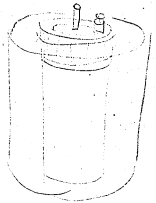
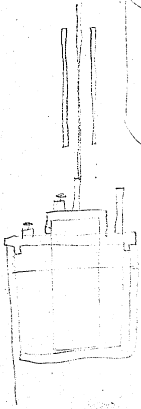
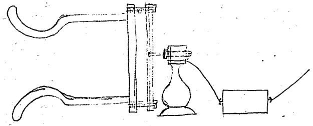




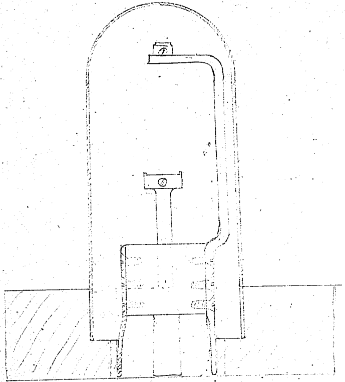




Febr. 10th 1879 Vacuum experiments for electric light.

J.K.

Chas Batchelor



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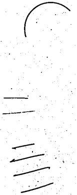
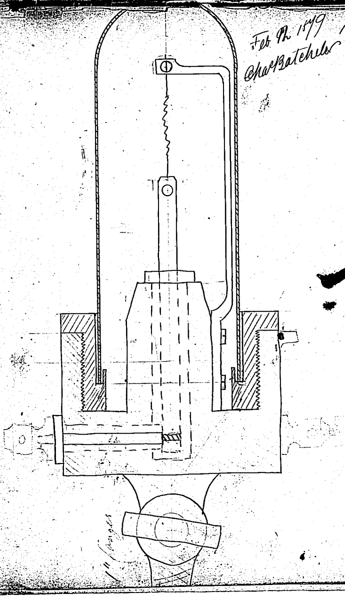
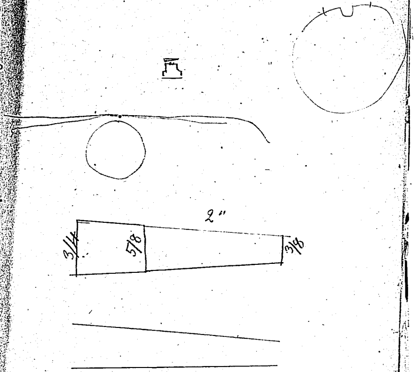
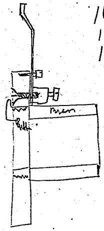


Feb 9th 1879
Chas Batchelor



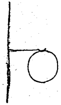

2"
3/4
5/8
3/8

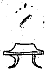
16 Bindposts
16 Springs
1 Rubber plate
1 Brass bush.

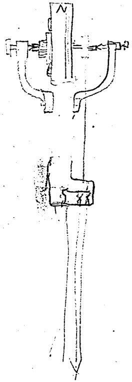


Edison's Magneto

When making another machine fasten down the armature wire that runs in groove on shaft by a thin sleeve

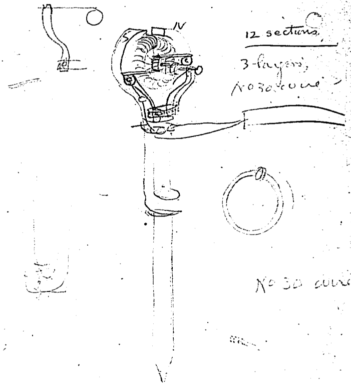






Feby-16 1879

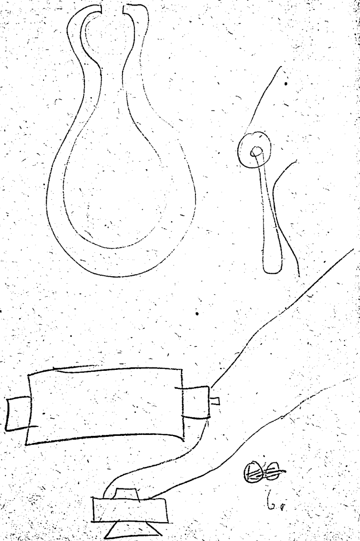
T.A.E



12 sections

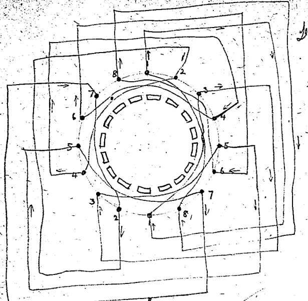
3-layers,
No 30 wire

No 30 wire



Feb 15 1879

C Batchelor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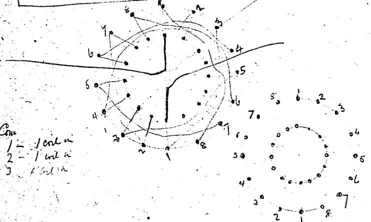
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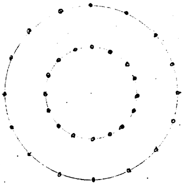
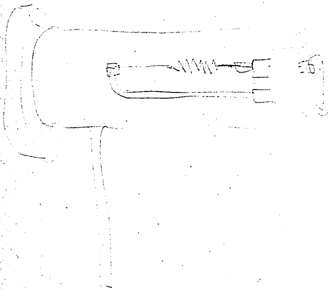
4
3
2
1

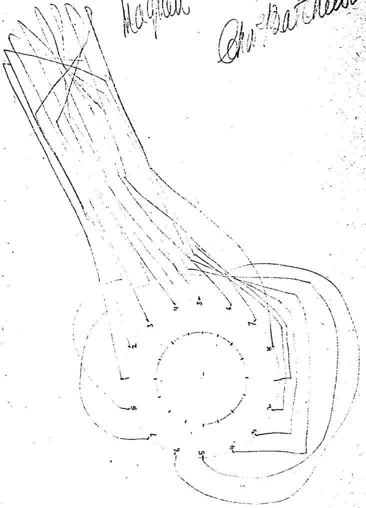
Com
1 = 1 coil in
2 - 1 coil in
3 . 1 coil in





Magneto Oct 15 1879

Chas Batchelor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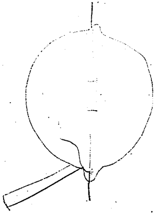
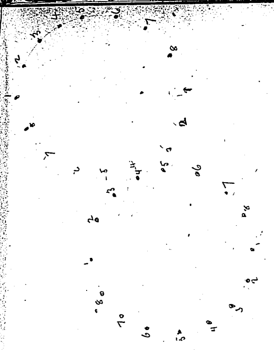
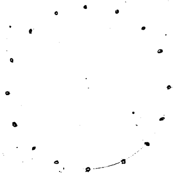
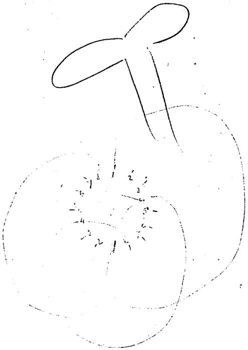
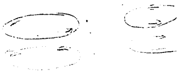


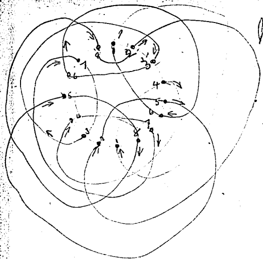


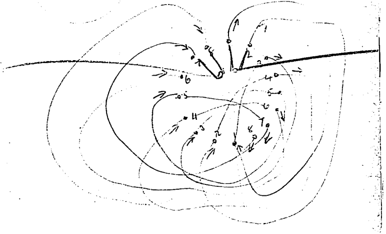


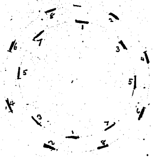


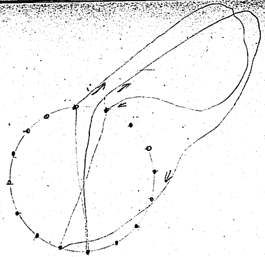


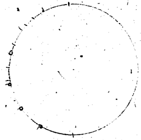
Magnets —
Feb 13 1879
Chas Batchelor

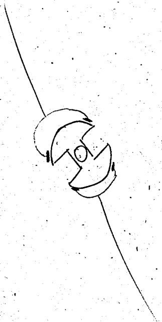


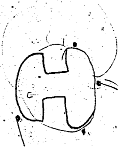






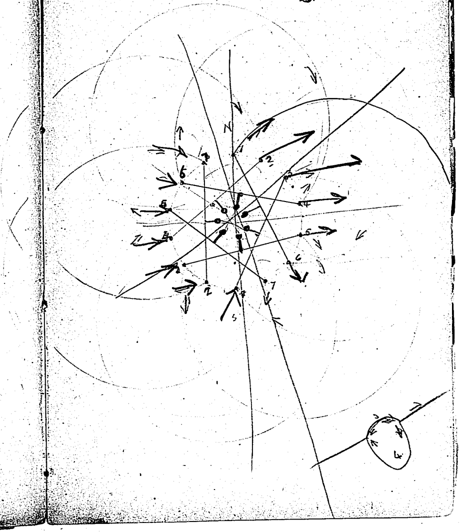


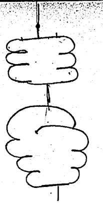


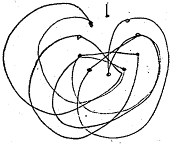


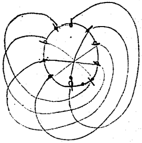
Feb 16th 1879

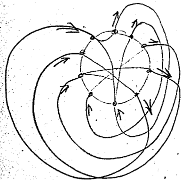
Chas Batchelor

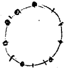


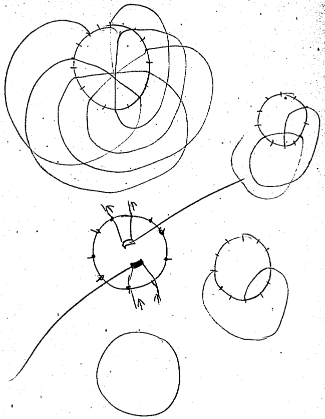


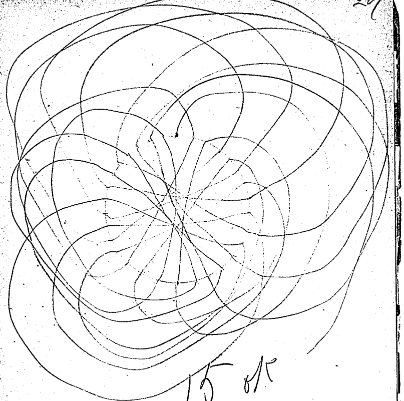










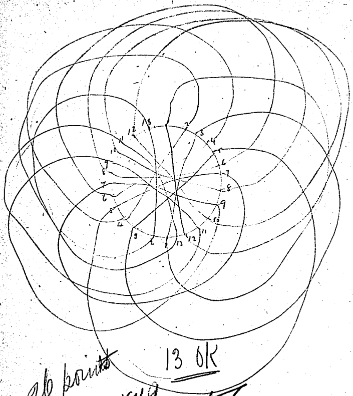


15 ok

31 points

Feb 15 1879

Chas Batchelor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12
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1
13

~~26 points~~

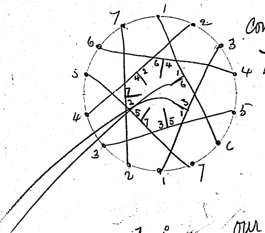
13 OK

Feb 15 1879

Chas Batchelor

35.1 18.9

Feb 17 1879
Chas Batchelor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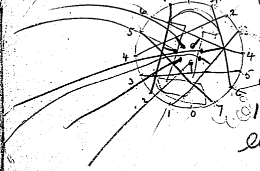
Connections for 7 coils


0
1
2
3
4
5
6
7
0
1
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3
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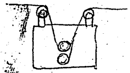
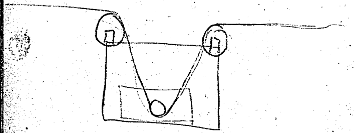
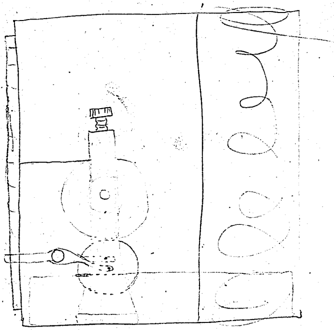
5
6
7

our machine connected as for 7 coils cutting out 1 coil of the eight

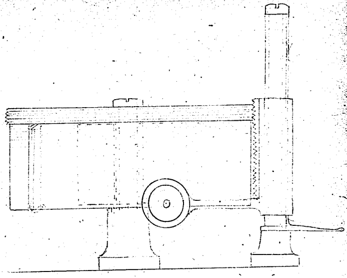


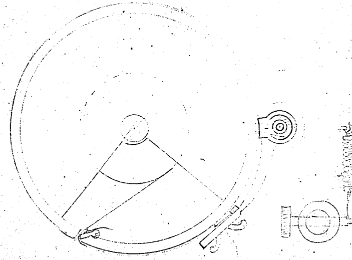


Pages 212 & 213. "Edison Electro-Motograph Telepho
Receiver Sketches." (Unimportant)

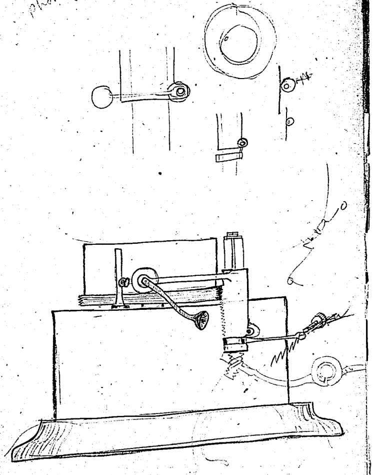


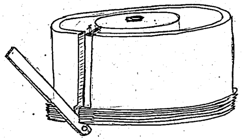
March 10th 1879
84



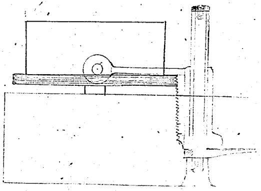


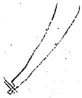
phonograph

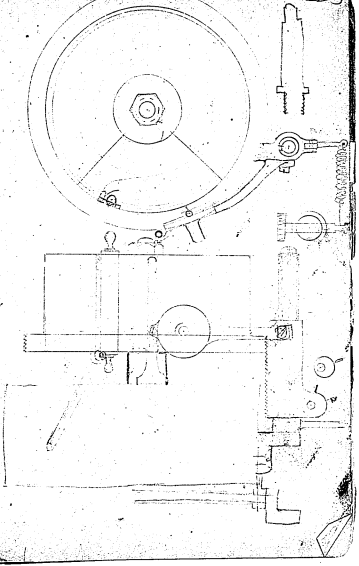




x is small lever to push the sliding piece in and out there is also one on bottom







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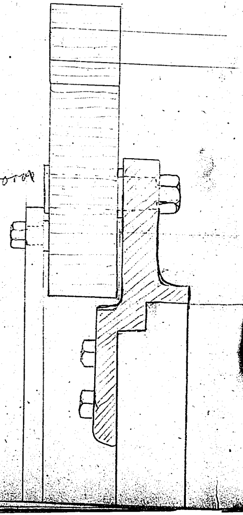
18

100) 18000
180

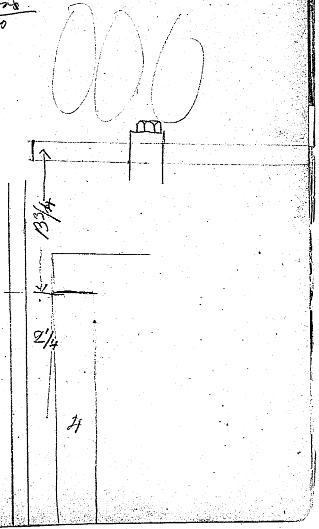


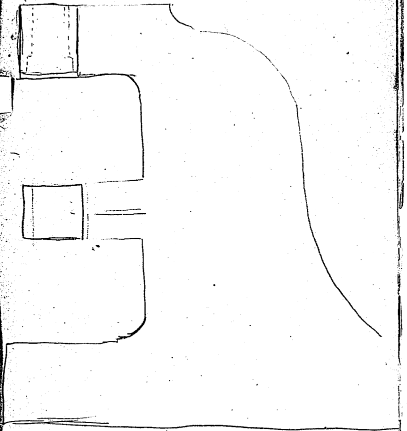
1 66) 132
62

19
38

228

20) 18000
900





.3 .33
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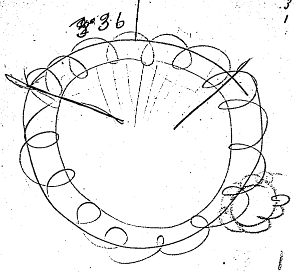
.02
.01



2.1
4
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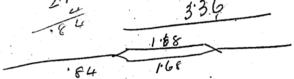

3.3.6
1.68
1.68
.84

100

.005 in Wire

10% Pt Ir.

500 mm 14.6 Ohms

20% 500 mm 12.9 ohms

Platinum 5.7 Ohms

$\bar{4}9999$
1.0066
$\bar{3}.9913$

.005

Platinum

500 mm

$\frac{1}{2}$ metre = $\frac{3.28}{2}$ ft = 1.64 ft

10% 14.6 1.1644
1.64 9.7852
0.9496 8.9

20% 12.9 1.1106
1.64 9.7852
0.8958 7.8

Pt 5.7 0.7559
1.64 9.7852
0.5411 3.4

per foot

35.1	1.5453 9.7852 1.3305
20.9	1.3201 9.7852 1.1053
3.23	0.5092 0.2944
18.9	1.2765 9.7852 1.0617
3.56	0.5514 9.7852 .3366
71.4	1.8537 1.6389
11.4	1.0569 0.8421
.41	$\bar{1}$.6128 $\bar{1}$.3980

---

500 mm

		Wt 100 mm	500 mm	1 foot
20%	.003	10.2 mg	35.1	21.45
	.004	17.4	20.9	12.7
	.005	27.2	12.9	7.9
	.010	109.	3.23	1.97
10% ~~.003~~				
	.004	17.4 mg	18.9	11.6
	.005	25.8	14.6	8.9
	.010	104.	3.56	2.17
Pt	.001	~~1.8~~ 2.87*	71.4	43.5
	.004	19.4	11.4	6.95
	.005	359	5.7	3.4
	.02	475.	.41	.25

20%

~~98 mm~~

98 mm .0273

$$\frac{17}{68} \quad 8.5$$

Pt 200 mm $\frac{950}{475}$

*Calculated from resistance

Wanted | Cost per oz
~~cost per Ohm~~

~~Length per Ohm~~

Cost per foot

~~Length per Ohm~~

Weight per foot

Feet per oz ~~& per grain~~

Weight per Ohm

Length " "

Cost " "

Ohms per foot

---

100 mm = .1 metre = $\frac{3.2808}{10}$ = .32808 feet

= 3.937 inches

1. mg = .0154 Grains

= .0000322 oz

$\frac{.32808}{.0154}$ ~~metre~~ Feet ~~feet~~ per grain when 100 mm weigh 1 mg

inverse ~~oz~~ grains per foot

$\bar{1}.5161$
$\bar{2}.1875$
1.3286
8.6714 - 10

$\frac{.32808}{.0000322}$ = Feet per oz

inverse oz. per foot.

500 mm an Ohm

$\bar{1}.5161$
$\bar{5}.5079$
4.0082

Length per Ohm inverse Ohms per foot
in inches X 12

Weight per Ohm
Length per Ohm multiplied Wt per foot

Cost per Ohm X price per oz

cost per foot

20% .003 Wire

Wt 100 mm
10.2 mg

35.1

Capitalize each
$16. for Central
Station

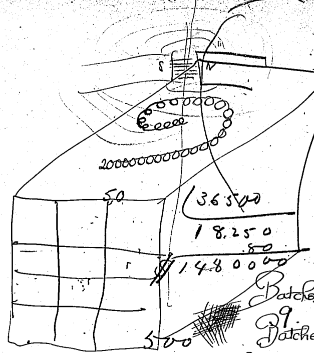
15

3000

35.

Each Station 75
of 3000 h p or
Cap of 18000 burners
90.
30000

Can control each station
having 3000 h p for
90 dollars per h p
which includes Dynamo
Engine Boiler shafting
& every appliance



3.6500
18.250
.80
$14.8000

Batchelor
9.
Batchelor
200000000
3000 Batchelor
200000000000000000
Batchelor

1 2.

2.

160,
10
1600

365 . 2 .
2 1600
219000
365
684000

1,74.
80
59,20

80
59
139,
10
1390
365
6950
690
834
4170
507,350

507.350

480) 2,247.00 (4.6
1920
3270
2880
390 0 00
3.9
3.

[illegible]

480 burners

80 hp Engine

burner $1\frac{74}{100}$ coal per hour per h.p.

would consume in a year 225 tons

Coal at 3.50,	7.88,00
wages 1 engineer at 2.50,	912.00
Stoker	547.00
	2,247.00

or $\$4\frac{68}{100}$ per annum.

1 mil & 1/3 per hour.

or 1 1/3 cents per burner

per day of 10 hours.

according to his own Estimate the cost of ~~1 per~~ each burner for a day of 10 hours, is 4.93 per year.

~~Of~~ a gas jet burning 5 feet per hour for 10 hours daily for 365 days will burn 18.250 feet, the Gas Co charge ~~the~~ public for this 41.06. These gas Engineers will whisperingly tell that no one knows how cheap gas can be made but they will admit that it

cannot be made & delivered for less than 60 c per thousand feet, this being the case the actual cost of the gas ~~to~~ consumed in 1 year from 1 burner of 10 hours is 10.96 cents. Now the wear & tear interest in plant is ~~as~~ as great with gas as with the El hence taking his own statement the cost of a given light when supplied by Electricity is $4\frac{93}{100}$ per annum & of gas 10.96, to say nothing of the Electric Light giving a much better one

giving off no sulphurous fumes
Carbonic acid or vitiating
the atmosphere by
burning the Oxygen
or blackening the walls

A capitalization of 22
dollars per lamp
will cover every cost,
but for main conductors
& central stations &
Lamps =

& perfectly accurate
Experiments have shown
that a company
exploiting the Electric

Light can produce in the
house of the consumer as
much light ~~from~~ 4 to 5 times
less money than it can be
supplied by burning gas —

7000
16

437.5
200

3.8451
1.2041
2.6410
.3200
2.9610

914. instead of 999.

20% ~~.0~~03   500 mm   90/ an oz $22.50 an oz

Wt 100 mm
10.2 mg   1.0086
1.3286
.3200
2.09 ft per grain
$\frac{7000}{16}$ grains per oz Avd
2.6410
914. ft.   2.9610
Wt per foot $\bar{1}$.6800
.488 grains
.00109 oz $\bar{3}$.0390
Cost per foot 225   1.3522
$\bar{2}$ 3912
$ .024
mg per foot $\bar{1}$.6500
6456 mg   2.8116
.4916
3.102 mg per foot
$\bar{1}$.5084
.322 ft per mg

R 500 mm
35.1
21.4
Ohms per foot
Wt per ft.
.0223
grains per Ohm
grains per oz
oz per Ohm
cost per Oz
$.00115
cost per Ohm
ft per Ohm
.0467

1.5453
9.7852
1.3305
$\bar{1}$.6800
1.3305
$\bar{2}$ 3495
2.6410
$\bar{5}$.7085
1.3522
$\bar{3}$.0607
$\bar{2}$.6695

[illegible] $\bar{8}$.[illegible]

10%   25.8
.005   Feet per grain   1.3286
.4116
Feet per 100 mm $\bar{1}$.9170

25.8 mg in 100 mm

25.8   1 4116
5.5477 -10
6.9593
$\bar{3}$.9593

$\frac{1}{2834~~9~~}$

28349. mg in 1 oz   oz in mg
$\frac{1}{28000}$
4.4523

$\bar{3}$.9593 oz
$\bar{1}$.5159 feet
$\bar{2}$.4434
.0414
$\bar{2}$.4848

100 mm
$\frac{1}{.3280}$ ft

~~.0~~0305 .0305

$\frac{1}{1000}$ oz $\frac{1}{3}$ foot

$\frac{11.00}{333}$ oz in foot

100 mi

25.8 mg

28.000 mg to 1 oz

$\frac{1}{1000}$ oz

100 mm

$\frac{1}{3}$ foot

100 ~~oz in 1 foot~~

oz in 1 foot

$\frac{1}{333}$ oz

$\frac{~~100~~}{333}$) 11.00 (3.3

999

1010

33 cts

---

2 inches .02 Pt

100 mm

.475 mg

.475.

8.15

2.6767

5.5477 - 10

$\bar{1}$.5159

0.9112

5.6515

$\bar{4}$.6515

$\frac{475}{28.000}$ $\frac{1}{3}$ .00448

28000)475

80000) 475.000 (.006

54 cts

475 2.6767

4.448. 5.5497 - 10

$\bar{1}$.5159 10.4841 - 10

.9112

41.2 cts $\bar{1}$.6197

16

$\frac{475.}{28000} \times 3 \times 11$

475
33

2.6767
1.5185
4.1952
4.4472
$\bar{7}.7480$

.56 cts

475.
comp 28349
comp log .3280
log 8.15

2.6767
5.5477 −10
10.4841 −10
.9112
$\bar{1}.6197$

41.2 cts

$\frac{475}{28000}$ 3 × 8

475
24

2.6767
1.3802
4.0569
4.4472
$\bar{1}.6097$

.407 cts

---

475. mg. in 100 mm

~~1mg weighs $\frac{1}{28349}$ oz.~~

Wt 1 ft in ~~grains~~ oz. of wire weighing 1 mg. per 100 mm.

~~1mg~~ = $\frac{1}{28349}$ oz

100 mm. = $\frac{1}{.3280}$ ft

5.5477 −10
10.4841 −10
~~36~~
16.0317
$\bar{4}.0317$

.000205

multiply wt. 100 mm in mg = weight per foot mg
× cost oz = cost per ft

5760 grains in 1 lb. Troy

1.2153

3.7604
.0843
3.8447

6999

3.8451

log 7000

$\frac{\cancel{500}}{7000}$
16

~~[illegible]~~
3.8451
1.2041
2.6410

437.5 grains in 1 oz avdp.

Cost per foot ~~$3~~ 3.75 | feet per $ | Weight per Ohm in oz / No. oz. in Ohm

$ .022 | 1.3522 / $\bar{2}$.9999 / $\bar{2}$.3521 | 44. 1.6479 | $\bar{4}$.9999 / 1.3305 / .000046 $\bar{5}$.6694

.032 | $\bar{3}$.2318 / 1.2729 / $\bar{2}$.5047 | 31. 1.4952 | $\bar{3}$.2318 / 1.1053 / .00013 $\bar{4}$.1265

.0403 | $\bar{3}$.4289 / 1.1761 / $\bar{2}$.6050 | 2481.3950 | $\bar{3}$.4289 / 0.8958 / .00034 $\bar{4}$.5317

.136 | $\bar{2}$.0287 / 1.0969 / $\bar{1}$.1256 | 7.5 0.8744 | $\bar{2}$.0287 / 0.2944 / .00542 $\bar{3}$.7343

.024 | $\bar{3}$.2318 / 1.1383 / $\bar{2}$.3701 | 42. 1.6299 | $\bar{3}$.2318 / 1.0617 / .00015 $\bar{4}$.1701

.0281 | $\bar{3}$.3978 / 1.0514 / $\bar{2}$.4489 | 3561.5517 | 3.3978 / .9496 / $\bar{4}$.4482 .000280 | $\bar{3}$.3978 / ~~1.0514~~ / ~~$\bar{4}$.3467~~

.095 | $\bar{2}$.0083 / 0.9717 / $\bar{2}$.9800 | 10. 1.0200 | $\bar{2}$.0083 / 0.3366 / .0067 $\bar{3}$.6717

.0075 | $\bar{4}$.4492 / 1.3010 / $\bar{3}$.7502 | 180. 2.2498 | $\bar{4}$.4492 / 1.6389 / .0000066 $\bar{6}$.8103

.019 | $\bar{3}$.2791 / 1. / $\bar{2}$.2791 | 53. 1.7209 | $\bar{3}$.2791 / 0.8321 / .00028 $\bar{4}$.4470

.0310 | $\bar{3}$.5500 / 0.9420 / $\bar{2}$.4920 | 322.5080 | $\bar{3}$.5500 / 0.5311 / .00104 $\bar{3}$.0189

.374 | $\bar{2}$.6643 / 0.9096 / $\bar{1}$.5739 | 260.4261 | $\bar{2}$.6643 / $\bar{1}$.3980 / .185 $\bar{1}$.2663

Cost per Ohm

$\bar{2}$.6695
$\bar{2}$.3521 $
$\bar{3}$.0216 .00105
$\bar{2}$.8945
$\bar{2}$.3047
$\bar{3}$.4992 .0031
$\bar{1}$.1042
$\bar{2}$.6050
$\bar{3}$.7172 .00514
$\bar{1}$.7015
$\bar{1}$.1256
$\bar{2}$.8312 .0679
$\bar{2}$.4383
$\bar{2}$.3701 .0020
$\bar{3}$.3084
$\bar{1}$.0505
$\bar{2}$.4489
$\bar{3}$.4993 .00315
$\bar{1}$.5623
$\bar{2}$.9800
$\bar{2}$.6336 .044
$\bar{2}$.3611
$\bar{3}$.7502
$\bar{4}$.1113 .00313
$\bar{1}$.1679
$\bar{2}$.2791
$\bar{3}$.4470 .0028
1.4689
$\bar{2}$.4920
$\bar{3}$.9609 .00914
$\bar{1}$.7020
$\bar{1}$.3737 1.88
.2757

Ohms per $

2.9784 950
2.5008 317
2.2888 194.
1.1680 14.7
2.6916 490
2.5007 316
2.3566 230.
3.8887 7700
2.5530 350.
2.0497 112
$\bar{1}$.7240 .53

In long are ...

0 $\bar{2}$.9914
0 $\bar{2}$.9595
0 $\bar{2}$.5624 3.65
$\bar{1}$ $\bar{3}$.9626
0 $\bar{1}$.7594
0 $\bar{1}$.5935 8.93
$\bar{1}$ $\bar{3}$.9830
1 $\bar{1}$.5421
0 $\bar{2}$.7122
0 $\bar{2}$.4438 276
$\bar{1}$ $\bar{2}$.3270

No. Ohms in 1 oz

2100 4.3306
7500 3.8735
2940 3.4689
1842.2857
6700 3.8299
3550 3.5517
210. 2.3263
154000 5.1897
3600 3.5530
957 2.9811
6.820 .8337

Feet in oz

.0322 $\bar{1}$.5073
.0188 $\bar{2}$.2754
.0120 $\bar{2}$.0797
.00304 $\bar{3}$.4785
.01888 $\bar{2}$.2754
.0127 $\bar{2}$.1043
.00319 $\bar{3}$.4989
.114 $\bar{1}$.0580
.0169 $\bar{2}$.2281
.00914 $\bar{3}$.9608
.000685 $\bar{4}$.8429

No. Grains in 1 Ohm

.023 $\bar{2}$.3506
.064 $\bar{2}$.8077
.163 $\bar{1}$.2123
2.64 0.4155
.071 $\bar{2}$.8513
.134 $\bar{1}$.1293
2.25 0.3529
.0031 $\bar{3}$.4915
.107 $\bar{1}$.0282
.502 $\bar{1}$.7005
88.6 1.9475

No. mg. in 1 Ohm

1.45 0.1622
4.1 0.6193
10.5 1.0239
168. 2.2271
4.6 0.6629
8.54 0.9313
146 2.1645
.2 $\bar{1}$.3031
6.9 0.8398
32.5 1.5117
5750. 3.7591

27 Ohm
25 Lamp
2 Battery

1 Lamps
2 Ohms Battery

$C = \frac{E}{R} = \frac{1}{3}$

$\frac{1}{9} \times \frac{3}{2} = \frac{6}{9}\ \frac{1}{3}$

$C = \frac{E}{R} = \frac{1}{27}$

$\frac{1}{27} \times \frac{1}{27} \times 27 = \frac{1}{27}$

$\frac{1}{27}$ is $\frac{1}{9}$ of $\frac{1}{3}$

$\frac{1}{9}$ as much energy total on 27 Ohm circuit.

$\frac{1}{9}$ $\frac{1}{3}$ Total.
$\frac{1}{9}$ in battery
Cost $\frac{2}{9}$ in Lamp

$\frac{1}{27}$

$\frac{25}{27 \times 27}$ $\frac{2}{27 \times 27}$ $\begin{array}{r} 27 \\ 6 \\ \hline 142 \end{array}$

$\frac{6}{27} = \frac{142}{27 \times 27}$

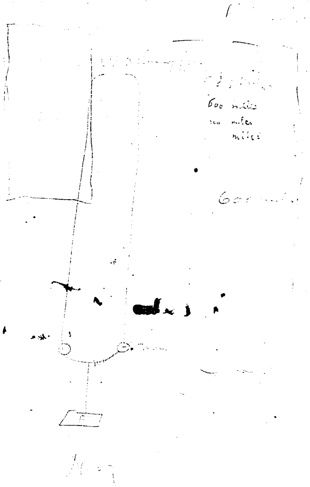
$25 \overline{)142}(5.7$
125
175

5.7 times more energy given off on 1 Ohm lamp than on 25 Ohm lamp.

Platinum wire marked
·005 measures in different
places ·00575 ·00590 ·0060

Platinum Iridium 10/o.
Marked ·005 measures
·005 only being ·0049 in one
place near end

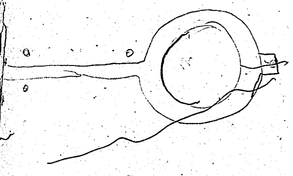
Plat Iridium 20 o/o
Marked ·005 measures

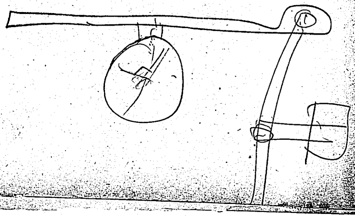

600 miles
miles
miles
600

Ph. 1. 42.305
2 43.62

2 cells .5 Ohm

2-25
2.47 22 minutes





.11363 Mg.

.00011363 Grammes

.0011363 1/10

.011363

Daniell's element E = 11

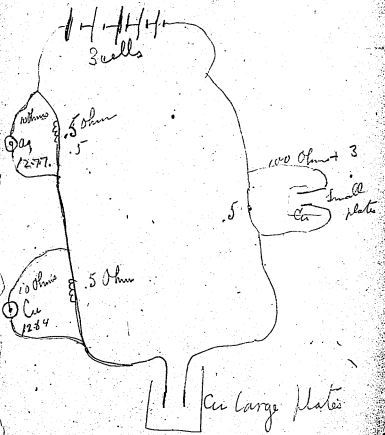
Volt = 1/10 Magnetic unit

.00093 E. B.00094

0000094

.00094

I want to try the following


3 cells
10 ohms
.5 ohm
.5
Ag
1277.
100 Ohms + 3
small plates
Cu
.5
10 ohms
.5 Ohm
Cu
1284
Cu Large plates

Time 3:24 P.M.

7-45

c² 3 . 2 4

R² 4 21

60

240

21

261

7.8

3

5.4

1.5

1.0

7.9

8 ohms

	log 3	0.4771	
~~comp~~ 3 log	8	9.0969	−10
comp log	1.14	9.9431	−10
log	3	0.4771	
log	1.015	0.0065	
comp	261	7.5837	
comp	60	8.2218	
		$\bar{4}$ 8062	

.00064

Pt crucible.

15.792

15.8975
15.792

.1055

Small bent Cu.

7.0752

7.0952
7.0752

.0200

Large plate

41.8672
.8334

4

Large plate corner cut

40.850

41.8338
40.850

.9838

L

Without cut

40.986
39.940

1.046
.983

63
32

983
32

1.015

26) 1.015 (.03

Small plate

[illegible] cut

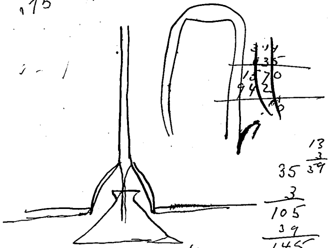
12.5768
12.557
.0198

[illegible] cut

[illegible].016
11.996
.020

1030
.125

.175



3.14
.035
1570
942

13
3
35 39
3
105
39
145
130
615
.035

.035
.0175

3.14
.0175
.0175
5.~~4~~7.9830

.4970
2.2430
2.2430

3868

.000967
4
.003868

.030
130
3900

030
090
2700
130

30
31
720
6
31
3720

.035

3.14
.0175
.0175

.4969
2.2430
2.2430
2.9829

30 220
110 Volto

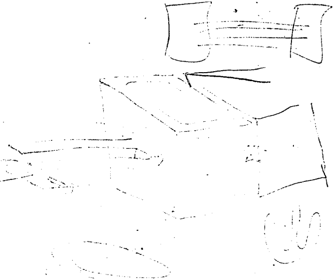
110
110
110
110
1210
443
3630
4840
4840
88) 536.030 0.608
528
803
724
790

5.5 per H.P.

5360

3a) 22a
7.33
12
1466
733
87.96

6088) 33000 (5.4 per H.P
30440
25600
24462



154
16
70

.0175 $\bar{2}$.24304
.0175 $\bar{2}$.24304
3.14 0.49693

$\bar{4}$.98301

13
52
35
4
140
52
192
30
162

.0009617

.01
.01
.0001

~~00~~

0.961

30)961(32.0

.035
.035

.024
.162

.0009697
4
.0038472

.024
.162

30)~~3847~~(1
~~138~~
~~30~~

35
0

.024
.162

.024
−162

~~31~~ 162)3847(23
324
607
486
1210

1795 049
5
8975245

61,162 570
8 975 245
52.187 325

7 162 360
−3 275 105
10 437 465
5
52 187 325

12.232 514
1 795 049
10 437 465

7 162 360
5
35 811 800

7,484,000) 39,100,000 (5.22
37 420
16800
14968
18320

624 3000
5
3,121.500

627.200
5
3136 000

134.032
5
356,336) 670,160 (1,8
35 63
31380
~~32504~~

Motor No. 2.